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# ON THE JOB SEARCH AND UNEMPLOYMENT DURATION

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## Abstract

Evidence on labour market flows in OECD countries suggests that, contrary to the popular wisdom, "sclerotic" European labour markets are characterised by relatively large rates of job creation and destruction. These large job turnover rates stand in sharp contrast with the low turnover of the unemployment pool in these countries and point to the important role played by job-to-job shifts in Europe. A model is developed which -- unlike standard theories of job matching with on-the-job search -- can account for large job-to-job shifts in the presence of high long-term unemployment rates. The two pillars of this model are: i) reduced search effectiveness for those with longer unemployment durations; and ii) competition for jobs between employed and unemployed jobseekers. Estimates of unemployment outflow equations allowing for varying search intensity according to unemployment duration and incorporating employed jobseekers do not falsify these two basic assumptions of our model.

Keywords: Job-to-job shifts, job turnover, unemployment turnover.

JEL: J10, J64.

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## Introduction

Labour market institutions of most European countries are often believed to inhibit the necessary mobility of workers in response to changing patterns in demand. In particular, employment security schemes, imposing advance notication of dismissals and non-negligible severance payments to employers in case of layoffs, are deemed to prevent downward employment adjustment during cyclical downturns and (for precautionary reasons) discourage hirings in expansionary periods. Because of these regulations and more or less explicit restrictions on temporary contracts, European labour markets would tend to offer many "jobs for life" and reduce the competition for wages between the "insiders" and the "outsiders". The term "Eurosclerosis" is frequently used to contrast this "rigidity" of European labour markets with conditions prevailing in countries like the US.

Available data on gross flows of jobs and workers across different labour market states (employment, unemployment, non-participation) come from a variety of statistical sources (Labour Force Surveys, unemployment registers, social security records, etc.) and are not fully comparable. Yet, they suggest that *labour mobility is not lower in European labour markets than in North-America.* Gross job creation and destruction rates are in many European countries, larger than in the US or Canada and labour turnover rates (the sum of hirings and separations) are of a similar order of magnitude than in North-America. Moreover, there are no significant differences in the time variation of gross job creation and destruction between European and North-American countries, while the strictness of employment security schemes would point to a smoother pace of job reallocation in Europe.

While European labour markets appear to be less sclerotic than usually thought, they nonetheless display a much poorer employment performance: in the US and Canada, employment per capita has continued to grow after the second oil shock, whereas all European countries have experienced declines in employment rates in the 1979-90 period. This poorer score in employment growth has been accompanied with a doubling of the incidence of unemployment while North-American countries have maintained the unemployment rates prevailing in the late 1970s. Moreover, the unemployment pool in Europe is stagnant: low inflow rates (persons entering unemployment over the working age population) point to a reatively low risk of becoming unemployed and low outflows from unemployment indicate that, once lost

a job, it is much more difficult to be reintegrated into work in Europe than in other OECD countries.

As flows from employment to non-participation are in Europe certainly not larger than those of North-American countries, large job reallocation rates and low unemployment turnover can only be reconciled by the occurrence of many direct shifts of workers from one job to another not involving intervening unemployment spells. Rather than the little mobility of the workforce, *a distinguishing feature of European labour markets* seems to be therefore *the large proportion of job-to-job (JJ) shifts*.

Why are JJ shifts so important in European labour markets? In this paper we argue that tight labour market regulations do not prevent the mobility of workers, but alter the characteristics of the job reallocation process. In particular, they reduce the role played in gross job creation and destruction by unemployment turnover. Insofar as employment security schemes constrain layoff and dismissal policies of firms, they reduce the pace of inflows into unemployment while they foster job-to-job shifts via two main channels. On the demand side, employers may induce workers to voluntarily leave, helping them to find alternative employment opportunities, rather than incurring in high dismissal costs. On the supply side, workers may find it less risky to look for another job while being employed and to change jobs because they fear less competition for jobs on the part of the unemployed, whose search effectiveness declines together with unemployment duration (e.g., because of human capital depreciation).

Policy-induced job-to-job shifts reduce the amount of job reallocation which can be accommodated via unemployment inflows and outflows, thereby increasing long-term unemployment and further reducing the "marketability" of those searching without having a job. Insofar as employers use voluntary separations as a way to costlessy reduce their workforce, quitters are not replaced and hence no vacancy chains are set in motion which could end-up creating other employment opportunities for the unemployed.

Surprisingly enough, these possible links between job-to-job shifts and unemployment durations have been fairly neglected by the literature on labour market flows. In the few cases where on-the-job search (and hence job-to-job shifts) is not

assumed away, it is supposed to be either a constant fraction of the labour force or to be dependent on the *stocks* of employment opportunities per jobseeker, summarised by unemployment/vacancy ratios. In other words, on the job search is either exogenous or is negatively correlated with unemployment, which is at odds with evidence discussed above, namely with the role played by job-to-job shifts in high unemployment Europe.

In this paper we show that endogenous on-the-job search can have implications which are not counterfactual. When allowance is made for negative duration dependence in exits from unemployment, on-the-job search can account for the high persistence of European unemployment compared with the US. Under duration dependence, on-the-job search is a function not only of the magnitude, but also of the duration structure of unemployment. Employed jobseekers compete mainly with the short-term unemployed as the long-term unemployed have low search effectiveness. It follows that, per given unemployment levels, a larger incidence of long-term unemployment tends to stimulate on-the-job-search and hence the proportion of vacancies filled via job-to-job shifts rather than via outflows from unemployment. In other words, endogenous on-the-job search tends to magnify the effects of duration on exits from unemployment at the aggregate level. Even mild forms of duration dependence can generate persistence in unemployment because of the competition between employed and unemployed jobseekers.

The plan is as follows. In Section 1 we present evidence on gross labour market flows in OECD countries. In Section 2, we introduce a simple model of endogenous job search and duration dependence. Finally, in Section 3 we empirically assess the implications of this model on the properties of empirical matching functions.

## 1. Employment Security, Job and Unemployment Flows

A common implication of models analysing the impact of employment security schemes on the labour market is that firing costs, procedural obstacles[1] to the layoff of workers and limits on the use of fixed-term contracts, tend to reduce not only gross job destruction, but also gross job creation [Bertola, 1990; Bertola and Ichino, 1994; Burgess, 1994; Millard and Mortensen, 1994]. Risk adverse employers are, in fact, likely to take into account the costs associated to reducing the workforce during "bad times" when deciding upon employment adjustment in response to improvements in the demand for their products. It follows that the extent of job reallocation -- commonly measured by job turnover rates (the sum of new positions created in new and expanding units plus posts being closed as a result of plant closures or downsizing, as a fraction of total employment) -- should be lower in countries with strict employment security schemes than in more "flexible" environments.

While these models have clearcut implications on the impact of employment security regulations on gross job flows, their predictions concerning the effects of layoff and dismissal constraints on employment and unemployment *stocks* are ambiguous [Lazear, 1981; Bentolila and Bertola, 1990, Mortensen and Millard, 1994]. This is because employment security regulations tend to have offsetting effects on the incidence (because of lower job destruction rates, hence lower inflows into unemployment) and on the duration of unemployment (because of lower outflows from unemployment). The overall impact of regulations on employment and unemployment will therefore depend on various factors, including the capacity of insiders to exploit the bargaining power given by firing restrictions, the importance of deterrents on gross job creation, and is likely to vary depending on the size of statutory severance pay and on the characteristics of regulations.

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1 Procedural obstacles (such as formal requests to the Labour Inspectorate, notification of planned layoffs to the trade unions, etc.) play in some countries (e.g., the Netherlands and Spain) even more important a role in delaying the pace at which firms shed redundant labour than regulations on severance pay. See Grubb and Wells (1993) for a well-documented discussion of the different dimensions of employment security regulations.

Overall, economic theory suggests that overregulated labour markets should experience relatively low gross job *flows*, but does not seem to reach clearcut conclusions as to the effects of employment security regulations on employment and unemployment *stocks*. Unfortunately, empirical evidence shows quite the opposite.

Table 1 displays rank correlation coefficients between, on the one hand, a ranking of countries by the strictness of employment security regulations recently produced by OECD (1994) and, on the other hand, average 1983-93 standardised unemployment stocks and flows figures[2]. In order to improve the cross-country comparability of data, we used unemployment stock and flow data coming from national Labour Force Surveys (LFS). These allow to approximate internationally agreed definitions of employment and unemployment, thereby improving the measurement of the incidence of unemployment. However, LFS provide less accurate measures of unemployment inflows. The latter can be measured by counting those found at the survey date to have been unemployed for less than one month, which means that unemployment spells started and ending in the month before the survey date are not counted. It follows that inflow rates are likely to be underestimated especially in dynamic labour markets where there are large cohorts entering and leaving unemployment within a month[3]. Data on job turnover, gross job creation and destruction are drawn from a database recently assembled by OECD[4]. They come from administrative records (e.g., social security, unemployment insurance and tax forms filled in by employers) tracking changes in the number of employees in each individual private establishments, excluding the self-employed. Although there are several problems with the cross-country comparability of such data[5], they

2 Unlike previous rankings proposed by the literature, the ranking used in Table 1 takes into account important features of employment security regulations, such as procedural and legal obstacles to dismissals.

3 Another option would have been to use data coming from administrative sources (e.g., unemployment registers), which track all persons registering at labour offices within a month, but are also affected by the coverage and generosity of unemployment benefit systems in the various countries and hence offer a poor basis for international comparisons.

4 See OECD (1994) for a detailed description of national sources for job turnover data.

5 See OECD (1994) and Grey (1993) for a discussion of cross-country comparability issues of job turnover data.

nonetheless offer a broad indication of the extent of job reallocation in the various countries.

Bearing the above caveats in mind, the table suggests that constraints on the ease with which firms can shed labour bear a strong inverse relationship with the size of inflow rates (the rank correlation coefficient is -.79 which is significant at 99 per cent confidence levels) while they are not significantly correlated to unemployment incidence. Surprisingly enough, there seems to be no correlation between strictness of employment security regulations and the extent of job reallocation.[6]

While there seems not to be any correlation between the magnitude of gross job flows and employment protection schemes, OECD countries with particularly strict regulations on dismissals and lower inflows into unemployment generally display the highest unemployment rates. The top panel of Chart 1 plots average unemployment and average monthly inflow rates (both weighted by the average yearly labour force) in OECD countries in the 1983-93 period. Consistently with the results displayed in Table 1, the chart shows that the countries which are typically located at the top positions of rankings by the strictness of employment protection legislations (e.g., Southern European countries like Italy, Spain and Portugal) display the lowest inflows into unemployment[7]. It also shows that some of the *countries with the lowest unemployment rates display the highest inflows into unemployment*. In particular, all non-European countries (except Japan, a country whose labour market institutions have been traditionally favourable to long job tenures) display relatively large inflows and relatively low unemployment levels. Finally, the bottom panel of Chart 1 shows that many low unemployment inflow countries display relatively large job reallocation rates. In particular, Italy, France and the Nordics belong to a group of countries with relatively low inflows into unemployment, but relatively large job reallocation rates.

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6 The effects of employment security regulations on the time-series properties of job turnover rates are analysed in Boeri (1995). We found that "overregulated" labour markets do not display either lower variability of gross job creation and destruction and cannot account for observed asymmetries in the cyclical behaviour of job turnover in the US compared to the other (mainly European) countries.

7 See OECD (1994), IOE (1988) and Grubb and Wells (1993).

Overall, contrary to predictions of various models of job reallocation with hiring and firing costs, *strict employment security regulations go hand by hand with lower inflows into unemployment, but not necessarily with lower job and labour mobility.* Moreover, there is not a positive correlation[8] between the size of inflows and the levels of unemployment across OECD countries, while we would expect inflow rates and unemployment rates to be strictly associated at least in the long-run[9].

Chart 2 helps understanding why, contrary to predictions of economic theory, there is not a negative correlation between the extent of job reallocation and the strictness of labour market regulations. The scatter diagram reports job destruction rates and (yearly) inflow rates in a number of OECD countries (both weighted by the labour force in each country). Job destruction and unemployment inflow data are clearly not strictly comparable as they come from different statistical sources (see above) and are based on different measurement criteria[10]. Job destruction rates are defined as a sum of first-differences in establishment-level employment *stocks* of shrinking units from one year to another, while yearly inflow rates cumulate quarterly *flows* into unemployment. Hence, we would generally expect inflow rates to exceed overall rates of job destruction. Yet, many European countries are located above the bisecting line throughout the origin of Chart 2. This suggests that *compared to countries like Canada or the US, in most European countries a relatively minor*

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8 The slope coefficient of the regression of unemployment against inflow rates is -1.42, which is not significant at conventional levels.

9 As shown by Hall (1982), when gross flows from and to non-participation can be neglected, the steady state unemployment rate is given by:

$$u = \frac{i}{i + o}$$

where "i" denotes the unemployment inflow rate (inflows into unemployment as a fraction of the employed) while "o" stands for the outflow rate (exit from unemployment as a fraction of unemployment). This suggests that unemployment should be in the long-term inversely correlated with the magnitude of inflow rates.

10 As discussed above, inflow rates are calculated based on the breakdown of unemployed by duration while job destruction rates are defined as the sum of establishment-level employment changes in declining or exiting units. See OECD (1994) for details on job turnover definitions.

*component of employment reductions is accommodated via flows into unemployment.*

The coexistence of comparatively large job destruction rates and low inflows into unemployment in "sclerotic" European countries could be explained by relatively large flows from employment to non-participation. Put another way, job destruction in Europe would be to a large extent accommodated by inducing workers to retire or withdraw from the labour force rather than becoming unemployed. However, data on flows from employment to non-participation in OECD countries do not lend support to this hypothesis. The top panel of Table 2 displays data obtained from linked LFS records (i.e. exploiting the panel component of each survey in order to get *objective* information on the same individual at different points in time); the bottom panel shows the same flows as could be estimated on the basis of retrospective questions (i.e. *subjective* individuals' answers concerning her/his labour market status one year before)[11]. Both sources seem to suggest that the countries where the extent of job destruction largely exceeds inflows into unemployment (e.g. Netherlands and Sweden and, in general, "sclerotic" European countries vis-a-vis North-America) experience relatively low flows from employment to non-participation[12]. Put another way, countries with the lowest inflows into unemployment as a proportion of the labour force (second column, reporting *yearly* inflow rates) are also characterised by comparatively low EO flows. This is consistent with the observation of even more marked differences across countries in the magnitude of *total* outflows from employment (second column, bottom panel).

Thus, large job reallocation rates and low unemployment turnover in "sclerotic" European labour markets can only be explained by a large number of workers changing jobs without intervening unemployment spells. Put another way, large job-to-job shifts seem to be the dominant factor behind the suprisingly large job

11 The availability of data for most countries for one-period only prevented us from controlling for cyclical conditions. Yet, observations referred the same year (and hence presumably the same cyclical conditions) for different countries still support the claim that EO flows are not larger in European labour markets than in the US.

12 This is consistent with evidence on gross labour market flows recently assembled by Burda and Wyplosz (1994) pointing to larger flows from employment to non-participation in the US than in European countries.

reallocation rates experienced by European countries. Unfortunately, no direct evidence is available on the magnitude of job-to-job shifts in the various countries. Yet data on job tenures in the EC[13] support the view that rigid labour markets generate comparatively large JJ shifts. In particular, they point to very large job-to-job shifts in Spain (with about one in four people changing job within a year) while the most "flexible" European labour market, the UK, displays mobility rates not dissimilar from those of a "rigid" country like Portugal and close to the EC average.

Bringing the different pieces of evidence together, *a distinguishing feature of "sclerotic" European versus North-American labour markets is not the lower pace of job reallocation, but the fact that most of this job turnover is accommodated without intervening unemployment spells.* This solves the puzzle, but opens two relevant questions. First, why is that tight labour market regulations produce so many job-to-job shifts? Theories of insiders-outsiders would suggest that employment security regulations could strenghten the bargaining power of insiders. This should result into higher wages, and longer job tenures, rather than in large job-to-job shifts. Second, why is high unemployment so frequently associated with low inflow rates?

In the following section we explore a possible answer to both questions. Sclerotic labour markets produce many job-to-job shifts because there are low flows into unemployment, and hence less competition for jobs on the part of unemployed jobseekers. A large number of employed jobseekers in turn makes it more difficult for the unemployed to be reintegrated into employment, puts a cap on the number of posts which can be filled by hiring unemployed persons. In this environment, equilibrium unemployment builds up only when it is of increasing duration, in line with long-term trends of unemployment in OECD countries.

13 See EC(1994), Chapter Four. See also OECD (1993) for data on job tenure in various OECD countries.

## 2. A Simple Model

Standard models of job matching under search equilibrium either assume away on-the-job search or treat it is a constant fraction of the labour force. As the flows from and to non-participation are typically neglected by this literature, on the job search is ultimately exogenous even in the models that do not confine job search to the unemployed. Two important exceptions are the models recently developed by Burgess (1993) and Pissarides (1994), which, developing on the framework originally proposed by Jovanovic (1979 and 1984), endogenize on-the-job search by explicitly modelling the decision to engage in job search on the part of those holding a job. In Pissarides' and Burgess' models, competition (or congestion) between employed and unemployed jobseekers results into an inverse relationship between, on the one hand, unemployment/vacancy ratios and, on the other hand, number of employed engaging in job-search, which is at odds with evidence displayed above. The latter suggests that high-unemployment countries, particularly countries with high long-term unemployment rates, are characterised by larger job-to-job shifts, hence supposedly by a larger fraction of employment engaged in job search.

Unlike Burgess and Pissarides, we will not impose in our model that unemployed of different duration face the same job finding probabilities, but allow short-term unemployed to have a higher probability of being reintegrated into work than the long-term unemployed. Negative effects of unemployment duration on job finding rates can be the byproduct of discouragement effects, human capital depreciation or loss of informal contacts with employers, marketplace effects promoting stock-flow (as opposed to stock-stock) matches (Coles and Smith, 1994) or ranking (based on unemployment durations) in hiring strategies of employers (Blanchard and Diamond, 1994). Any of the above mentioned explanations for negative duration dependence in job matching can be accommodated within our simplified framework without altering the relevant predictions of the model. Consequently, we do not opt for any specific theory (neither we could empirically discriminate among them in the light of data limitations) and we use the rather neutral term *search effectiveness* to denote these asymmetries between short-term and long-term unemployment.

Job-to-job transition rates will also be allowed to differ from exit-to-job rates for the short-term unemployed, but we will not make any assumption concerning the sign of

this difference, as neither empirical evidence or theoretical considerations can offer much guidance in this respect. On the one hand, employed jobseekers may experience higher job finding rates because their employment is considered as a good signal by the employer or they have better access than the unemployed to (informal) information channels on job opportunities. On the other hand, the (short-term) unemployed are likely to devote more time and efforts to job search than the employed jobseekers and to be available to immediately pick up opportunities as soon as they arise.

The above considerations can be summarised in the multi-level matching function:

$$JC_t = M(J^*_{t-1}, V_{t-1}) = M(su\,U^s_{t-1} + sl\,U^l_{t-1} + sj\,J_{t-1}, V_{t-1}) \quad sl < su,\ sl < sj \qquad (1)$$

where $U^s$, $U^l$ and J denote, respectively, short-term and long-term unemployed and employed engaged in job search, JC stands for (gross) job creation and V for the vacancy stock while J* is total number of "effective" jobseekers (i.e., converted by proper weighting into efficiency units). In other words, for simplicity (and because we aim at developing implications which can be empirically tested based on available data) we assume that employed jobseekers, short-term unemployed and long-term unemployed are, from the standpoint of matching technologies, perfectly substitutable up to scalar parameters. An advantage of this specification is that it allows for simple empirical tests of the hypothesis of varying versus fixed search effectiveness among employed jobseekers, short-term and long-term unemployed[14]. Consistently with most literature on gross job flows, we will also assume that matching technologies (not necessarily unemployment outflows!) are homogenous of degree one in V and J*. This rules out (counterfactual) implications such as the presence in large countries of relatively low gross hiring rates and is consistent with a constant growth of employment along the balanced growth path.

14 See Section 3. The parameters su,sl and sj can be interpreted as the product between, on the one hand, the share of job offers going, respectively, to short-term and long-term unemployed and to employed jobseekers, and, on the other hand, corresponding job acceptance probabilities. Available data do not allow for separately identifying job offer and job acceptance shares.

Under these matching technologies, transition rates from short-term unemployment to employment ($\pi_s$), from long-term unemployment to employment ($\pi_l$), and from employment to employment ($\pi_j$) are, respectively, given by:

$$\pi_s = suM(1, \frac{V}{J*}) \qquad (2)$$

$$\pi_l = s_l M(1, \frac{V}{J*}) \qquad (3)$$

and:

$$\pi_j = sj\, M(1, \frac{V}{J*}) \qquad (4)$$

To simplify matters, we define the short-term unemployed as those workers who have been unemployed for one period only[15]. Their value function is therefore given by:

$$V_u^s = u - c_u + \delta[\pi_s \max(V_E, V_J) + (1 - \pi_s)V_u^l] \qquad (5)$$

where u denotes the unemployment benefit, $c_u$ is the cost of job search for the unemployed and $\delta$ is the discount factor. Similarly, the value of being long-term unemployed is given by:

15 This implies that the stock of short-term unemployed is determined only by the magnitude of inflows into unemployment.

$$V_u^l = u - c_u + \delta[\pi_l \max(V_E, V_J) + (1-\pi_l)V_u^l] \quad (6)$$

where for simplicity we assume that asymmetries between long-term and short-term unemployed are confined to job finding rates only[16]. The two remaining values are those most relevant for decisions of employed to engage or not in job search. First, we have the value of searching while being employed:

$$V_j = w_j - c_2 + \delta(1-d)[\pi_j V_e + (1-\pi_j)\max(V_e, V_j)] + \delta d V_u^s \quad (7)$$

where $c_2$ denotes costs of job search for the employed, d the (exogenous) dismissal rate (see below), and w the wage rate currently earned by the jobseeker. As is apparent from (7) a successful employed jobseeker waits at least one period before seeking for another job in his/her new position. Finally, we have the value of being employed and *not* seeking for another job:

$$V_e = w_e + \delta[(1-d)\max(V_e, V_j) + d V_u^s] \quad (8)$$

An employed jobseeker will continue to search for a job insofar as $V_j > V_e$. As in Jovanovic (1984) model, this condition implicitly defines a cutoff wage rate (say w*) at which workers are indifferent between continuing or terminating job search whilst being employed. Those earning less than w* will search, while those earning more will not.

A non-degenerate wage distribution can be obtained simply by hitting match productivity with idiosyncratic shocks (having some degree of persistence in order to induce on-the-job search in presence of search costs). Along with Mortensen and Pissarides (1994), we will therefore assume that wages are a constant fraction of

16 We could have assumed that the long-term unemployed are entitled to lower (if any) unemployment benefits or that they face higher search costs than the new entrants into unemployment pool, but this would have not altered the properties of our model while making its structure somewhat more complex.

match-specific productivity and that the latter evolves in accordance to a Poisson process with arrival rate $\lambda$. When match productivity changes, it is drawn from a (fixed) distribution with finite (and positive[17]) upper and lower supports. As shown in Annex 1, the reservation wage, w* will then depend on $\pi_j$ and on the other relevant parameters of (5), (6), (7) and (8). In particular, w* is increasing in $\pi_j$, that is, for larger job-to-job transition rates a larger portion of employment will engage in job search.

When deciding on whether or not to engage in job search, employed individuals form expectations about the probability of finding a suitable job, based on current levels of short-term and long-term unemployment as well as vacancies. Now, from (1), (2), (3) and (4) we have the partials:

$$\frac{\delta \pi_j}{\delta U^s} < \frac{\delta \pi_j}{\delta U^l} < 0, \quad \frac{\delta \pi_j}{\delta V} > 0 \qquad (9)$$

In other words, ceteris paribus, an increase by one unit of the stock of short-term unemployed reduces job-to-job transition rates more than a marginal increase in the stock of long-term unemployed because of the greater search effectiveness of those with short unemployment durations. In the light of (9) we can then write the proportion $\phi$ of employed engaged in job search, as a function of vacancies and of the two unemployment pools:

$$\phi(V, U^s, U^l) \qquad \phi_v > 0, \ \phi_s < \phi_l < 0 \qquad (10)$$

Unlike in Pissarides and Burgess models, the proportion of employed jobseekers is therefore a function not only of unemployment and vacancy *stocks*, but also of the *flows* characterising the duration structure of unemployment.

17 Allowing for match productivity to fall below zero would ultimately imply endogenising layoff rates in this model. We do not pursue this route herein for the sake of simplicity.

Our next step is to relate job-to-job shifts to employment dynamics. The law of motion of gross job creation is given by equation (1). Concerning job destruction, we assume that each year a fraction d of the total number of workers is laid-off[18] because their jobs become unprofitable (e.g., due to idiosyncratic shocks to match productivity). We further assume that laid-off workers cannot immediately move to new posts, but have to experience an intervening unemployment spell[19]. This is consistent with the view of job matching as a time-consuming process requiring on both sides, employers and jobseekers, active search. Normalising the labour force to one, it then follows that gross job destruction is given by:

$$JD_t = [d + (1-d)\pi_j \phi](1 - U_{t-1}) \qquad (11)$$

In other words, JD occurs either as a result of genuine job destruction, that is, jobs becoming unprofitable or as a byproduct of voluntary quits of workers being successful in their on-the-job search. In order to close our model, we have still to specify the law of motion of vacancies. We assume that new vacancies are posted at a rate $\gamma$ of the total number of idle positions (unemployment less unfilled vacancies). Vacancies are then filled next period via the matching technology described by (1), i.e.:

18 Another possible departure from our simplified setup, would be to assume that d (as well as the parameter g defined below), rather than being deterministic, depends on the realisation of an aggregate shock (Boeri (1995)). We do not follow this route here as we are interested in the steady state properties of our model only.

19 This means that in our model labour turnover (the sum of hirings and separations) always equals job turnover (the sum of first differences in establishment-level employment stocks).

$$\Delta V_t = \gamma(\dot{U}_{t-1} - V_{t-1}) - M(J^*_{t-1}, V_{t-1}) \qquad (12)$$

Equation (12) therefore implies that voluntary quitters are not replaced by employers, who rather use voluntary separations as a way to reduce their workforce. Put another way, quits do not set in motion a vacancy chain[20].

Following Blanchard and Diamond (1989), we do not allow wage determination to play any role in job matching this model[21] and we focus on stationary wage distributions. Given that the proportion of employed jobseekers engaged in job search is constant when vacancy, short-term and long-term unemployment stocks do not vary, the labour force is fixed, and short-term unemployment always equals unemployment inflows (i.e. a constant proportion of employment given by the exogenous layoff rate), the steady state equilibrium can be fully characterised by the two conditions:

$$\Delta U = d(1-U)[1 - su\, M(1, \frac{V}{J^*})] - sl\; U^l M(1, \frac{V}{J^*}) = 0 \qquad (13)$$

stating that inflows into unemployment, less the short-term unemployment finding a job within one period (i.e., inflows into long-term unemployment) should equal outflows from long-term unemployment and:

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20 Alternatively, we could have assumed that only a fraction of quitters is replaced, and that this fraction is decreasing in the degree of strictness of employment security regulations (hence the use of quits as substitutes for layoffs). While this would be a straightforward extension of our model, available data do not allow to empirically assess such parameter restrictions.

21 Match productivity does not affect match acceptance insofar as wages are established (e.g., under Nash bargaining) as a constant fraction of the match surplus [Blanchard and Diamond, 1989]. Alternatively, we could assume -- along with Jovanovic's (1984) model -- that wages equal labour productivity but that -- due to noisy signals of individuals' abilities -- employers and workers only gradually learn about the true productivity of their match. In both cases pj has to be interpreted as an offer arrival rate, independent of the current wage earned by the employed jobseeker, and hence bearing a close correspondence with the U-E probabilities, ps and pl.

$$\Delta V = \gamma (U - V) - M(J^*, V) = 0 \qquad (14)$$

stating that the inflow of vacancies should equal the total number of matches (filled vacancies).

Chart 1 displays the Beveridge (UV) and the vacancy (VV) curves, implicitly defined by equations (13) and (14), in the U-V space. Both curves have the standard slope insofar as $\delta J^*/\delta U^l$ is negative, that is, a marginal rise in long-term unemployment leads to a reduction in in the number of "effective" jobseekers because of the substitution of unemployed for employed jobseekers. This will always be the case when sl is small relative to sj[22].

The economics behind the slope of the two curves is as follows. The UV curve slopes downwards because, per given inflow rate, a rise in unemployment has to be compensated by lower vacancies in order to keep unemployment outflows constant. As shown in Annex 2, the UV curve is steeper the more responsive is J to changes in the number of long-term unemployed: a rise in $U^l$ would in fact increase unemployment outflows either directly and indirectly, that is, via reductions in the number of competing jobseekers who are not coming from the unemployment ranks. The VV curve is upward sloping because larger vacancy inflows (as those associated to a rise in the number of idle positions, per given $\gamma$) have to be compensated by an increase in the number of filled positions, hence, given the matching technology, by a larger number of vacancies. The lower sl relative to sj, the greater the reduction in the number of "effective" job seekers associated to changes in U, the steeper the curve, because more vacancies will be required to compensate reductions in the overall effectiveness of job matching.

The steady state equilibrium lying at the intersection of the two curves is globally stable.

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22 In fact:

$$\frac{\delta J^*}{\delta U^l} = sl - sj(\phi - \phi_l(1 - U))$$

and we know by (10) that $\phi l$ is negative.

We can now assess the comparative statics effects at the steady state of changes in the (exogenous) job destruction rate, d (e.g., induced by marginal reductions in the strictness of employment security schemes). As depicted in Chart 1 (the formal derivation is in Annex 2), these involve a rightward shift of the UV curve like in standard matching models[23]. However, in this case also the VV curve will shift because of substitution between employed and unemployed jobseekers on job matching, hence on the pace at which vacancies are filled. In particular, the VV curve will shift rightward when the total number of effective jobseekers (J*) decreases as a result of the increase in the number of short-term unemployed. In this case, along with conventional wisdom, the long-run equilbrium unemployment rate will rise. But the VV curve could also shift leftwards thereby leading to lower unemployment and vacancy rates. In general the larger the search effectiveness of short-term unemployed relative to employed jobseekers (i.e, the larger su relative to sj), *the more responsive the share of employed seeking jobs to increased competition from unemployed jobseekers*[24], *the more likely that larger unemployment inflows could translate into lower unemployment in the long-run.* The effects of a rise in job destruction on unemployment are therefore ambiguous, while at the new steady state equilibrium, there will always be a larger number of vacancies.

## 3. Empirical Relevance of the Model

Two basic assumptions of our model are i) declining search effectiveness with unemployment duration, and ii) competition for jobs between employed and unemployed jobseekers. Hence, we will first evaluate the empirical relevance of the first assumption, based on estimates of unemployment outflow equations. Next, we will turn our attention to available evidence, coming mainly from Labour Force

23 See Boeri (1995) for an analysis of the effects of changes in the tightness of employment security regulations on job flows in standard matching models.

24 The elasticity of $\phi$ with respect to changes in the number of short-term unemployed will also depend on the characteristics of the underlying wage distribution. The more compressed the wage distribution (at least in a contour of the initial reservation wage), the stronger the effects of changes in Us on the share of employed jobseekers.

Surveys, on search on-the-job and estimate matching functions embodying the competition for jobs between unemployed and employed jobseekers.

Table 3 displays results obtained by estimating a matching function in which the unemployment stock was split into two separate pools, according to the duration of spells of joblessness. In particular, the functional form used in estimation was the CES:

$$OJ_{it} = A_{it}[su\ U^{s}_{it-1}{}^{-\rho} + sl\ U^{l}_{it-1}{}^{-\rho}]^{-k/\rho} V^{\alpha}_{it-1} e^{\varepsilon_{it}} \qquad (15)$$

where $A_{it}$ denotes fixed regional (subscript i) and time (e.g., "disembodied" technological progress in job matching, subscript t) effects. In other words, consistently with the specialization of the matching function provided in the model, we allowed the two unemployment pools to be perfectly substitutable up to a multiplicative parameter. We also did not impose homogeneity of degree one in the three arguments as constant returns in job matching (including employed jobseekers) does not necessarily imply constant returns in outflows to jobs[25]. By taking logs and a second-order expansion around $\rho=0$, we then obtained the linear form:

$$o_{it} = a_{it} + su\ k\ u^{s}_{it} + sl\ k\ u^{l}_{it-1} - \frac{1}{2}\rho\ k\ su\ sl\ [u^{s}_{it-1} - u^{l}_{it-1}]^2 + \alpha\ v_{it-1} + \varepsilon_{it} \qquad (16)$$

An advantage of this linearisation is that it allows for the identification of the structural parameters of interest[26] (namely su, sl, v and $\rho$) and hence for simple tests

25 See Burgess (1993) for a discussion of properties of unemployment outflow functions in relation to those of the underlying matching function.

26 In fact, based on (16), we can estimate:

$$o_{it} = d_i + d_t + \beta_1 u^{s}_{it} + \beta_2 u^{l}_{it-1} + \gamma\ [u^{s}_{it-1} - u^{l}_{it-1}]^2 + \alpha\ v_{it-1} + \varepsilon_{it}$$

where d stand for district (subscript i) and time (subscript t) dummies. We can recover the structural parameters as follows:

of the hypothesis that search effectiveness is higher for short-term than long-term unemployed.

We run this regression against a panel of yearly data on the OECD countries displayed in Chart 1[27], as well as monthly, district-level data on unemployment stocks by duration, outflows to jobs as well as vacancies notified to the labour exchange for the Czech and Slovak Republics. The latter data clearly offer much more degrees of freedom in selecting the estimation framework than aggregate yearly data[28]. As we could check in the course of visits to labour offices of the Czech and Slovak lands, they are high-quality administrative data. In both countries, unemployment benefits are provided up to six months of duration[29]. However, those who have not found a job within that period have to keep registration to labour offices in order to apply for forms of social assistance of the last resort. Hence, unsurprisingly, comparisons with the national LFS suggest that register data offer a good coverage of long-term unemployment in both countries.

---

$$su = \frac{\beta_1}{\beta_2 + \beta_1} \quad sl = \frac{\beta_2}{\beta_2 + \beta_1} \quad k = \beta_1 + \beta_2$$

and

$$\rho = -2\gamma(\beta_1 + \beta_2)/\beta_1 \beta_2$$

27 Unfortunately available data for OECD countries do not permit to disentangle outflows to jobs from flows from unemployment to out-of-the labour force, which may be positively correlated with the duration of unemployment (e.g. because of discouraged workers effects). This suggests that differences in elasticity of job finding with respect to short-term and long-term unemployment would be more marked when focusing only on UE flows.

28 An important advantage of using administrative data, rather than information coming from the national Labour Force Surveys, is that the former provide much richer a detail of unemployment and vacancy flows by region. This relevant cross-sectional dimension of data significantly increase the degrees of freedom allowing, inter alia, for taking into account "technological progress" in job matching (e.g., including time dummies) as well as possible regime shifts alterating the properties of matching functions.

29 The two countries have maintained, with a few exceptions, the same labour market policy regulations prevailing before the split of the country. While the Czech Republic has been able to maintain -- unlike all the other transitional economies of central and eastern Europe -- very low unemployment rates by western standards, Slovakia has two-digits unemployment rates.

Table 3 reports estimates in levels (including time and district dummies in the case of the Czech and Slovak Republics) as well as in first differences. When we included a lagged endogenous variable in the difference equation, we used a GMM estimator (hence different instruments in different periods) defined over lagged outflows from t-2 backward. The long-term unemployed were defined either as those having been registered for at least 12 months (which is in line with commonly agreed definitions of long-term unemployment) and as those with unemployment duration greater than one month, which more closely corresponds to the specification of our model.

Regression results support the existence of decreasing "search effectiveness" with unemployment duration. Both su and sl coefficients are positive and significant (with the exception of the sl coefficient in the level regression for the Czech Republic and, in some cases, when we approximate short-term unemployment by inflows), but su is much larger than sl. It should be stressed that, according to our model, the omission of employed jobseekers in the estimated unemployment outflow equation would bias upwards[30] the estimates of both short-term and long-term unemployment coefficients because these coefficients embody the effects of reductions in the number of (competing) employed jobseekers associated to a rise in $U^s$ and/or $U^l$. In particular, the larger sj, and the more responsive employed jobseekers to changes in unemployment, the larger the bias induced by omitting J from the estimated equation. The vacancy coefficient will instead be biased downwards[31], which may contribute

30 In fact for i = s, l:

$$\frac{\delta O}{\delta U^i} - \frac{\delta O}{\delta U^i_{|dJ=0}} = -\frac{O}{J^*}(1-\eta_{mj^*})sj\, J_u$$

where $\eta mj^*$ stands for the elasticity of matching with respect to J* (included between zero and one, by the assumption of constant returns to scale), and Ju for the responsiveness of employed jobseekers to a marginal increase in unemployment (negative in our model).

31 In fact:

$$\frac{\delta O}{\delta V} - \frac{\delta O}{\delta V_{|dJ=0}} = \frac{O}{J^*}(1-\eta_{mv})\, sj\, J_v$$

where $\eta mv$ stands for the elasticity of matching with respect to vacancies, and Jv for the responsiveness of the number of employed jobseekers to changes in the number of vacancies.

to explain the low V coefficients generally obtained when approximating matching functions with estimates of unemployment outflow equations[32].

Overall, *estimates of the unemployment outflow equations consistently point to significant effects of duration on job finding probabilities*. Studies carried out on micro data from the unemployment register in the Czech and Slovak lands [Ham, Svejnar and Terrel, 1994] found a negative (but weaker) effect of duration on individual hazard rates. Our estimates point to much a stronger effect of unemployment duration on job finding rates, which could be possibly explained by the fact that competition effects between unemployed and employed jobseekers can only be captured by using aggregate data[33].

Further insights on the empirical relevance of our model can be possibly gained by looking directly at data on employed jobseekers. Needless to say, the identification and measurement of employed actively seeking for a job is a dauntingly difficult task. However, the Eurostat Labour Force Survey questionnaire -- currently adopted by most EC countries (as well as, with minor changes, by some central european countries) -- requires interviewers to query on job search activities on the part not only of the unemployed, but also of those being employed at the survey date[34].

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32 Tests of constant returns in long-term, short-term unemployment and vacancies are also reported in Table 3, although they cannot be interpreted as tests of constant returns in the overall matching technologies in the light of the above qualifications. In any event, we reject the presence of constant returns in job matching consistently with previous estimates of unemployment outflow equations in these countries [Boeri, 1994; Burda and Lyubiova, 1994]. Finally, displayed test-statistics for r support the CES functional form specification against the Cobb-Douglas, lending further support to our assumptions concerning the substitutability between long-term and short-term unemployed.

33 The gap between the estimated search effectiveness of short-term and long-term unemployed may also be affected by the omission of employed jobseekers insofar as J may be more responsive to changes in Us than Ul (which is also consistent with our model).

34 The question asked to all individuals in working age is "Have you been looking for a job last week?". If the answer is positive, the interviewed is then requested to specify the reasons and methods of job search.

Questions are also included in the LFS questionnaire as to the reasons for job search and the methods of search of employed jobseekers. Cross-tabulations of employed jobseekers by reason and method of job search -- which we could obtain only for a few European countries (UK, Italy and Slovenia) -- suggest that those seeking a job because their current position is temporary or fear losing their job use search methods not too dissimilar from those of the unemployed. In particular, those "pushed" to seek a job use more than other employed jobseekers the public employment service and its vacancy register. Those seeking because "pulled" from other jobs, i.e. those declaring to be searching because looking for better jobs, use more insertions and newspaper ads as well as informal channels than unemployed jobseekers. They also have, in general, higher levels of education than the unemployed.

Table 4 reports average 1983-91 data drawn from national Labour Force Surveys of European countries on employed declaring to be searching for another job. As we expect competition with unemployed jobseekers to especially arise on the part of the "push" group, we provide information not only on total employed jobseekers, but also on the various components of this population. In particular, JTOT refers to the grandtotal of those working and declaring to be actively searching for a job in the reference week, JPUSH to those declaring to be searching because their current job is at risk or temporary, and JPULL for those explicitly declaring to be seeking better working conditions.

Table 4 suggests that on-the-job search is remarkably large in transitional economies, like Poland and the Czech Republic, which are coming from very rigid labour markets (markets where there was no freedom to dismiss workers) and at the start of transition have introduced rather tight regulations on advance notification of layoffs and severance pay in order to contain inflows into unemployment[35]. Relatively large shares of employed seeking for another job, notably JPUSH measures, are also observed in some of the European countries placed at the top of rankings by the strictness of employment security schemes, like with Italy and Spain. More flexible labour markets, like the UK and Denmark, also display relatively large shares of employed jobseekers, but these are mainly of a JPULL nature (fourth column). The (cross-sectional) correlation coefficients displayed at the bottom of Table 4 confirm

35 See OECD (1994) and Boeri (1994) for a discussion of employment security regulations after the start of transitions in central and eastern Europe.

the impression that the two pools of employed jobseekers have quite different characteristics and responsiveness to labour market conditions. While one finds less JPULL type of jobseekers in high unemployment countries, the number of those pushed to search on-the-job tends, if anything, to be positively associated with labour market slack. Moreover, only JPULL is significantly (and positively) correlated across countries to vacancy rates, suggesting that those "attracted" by other jobs may be more responsive to a greater availability of employment opportunities than those "forced" to search. We interpret these results as indications that the proposed breakdown of JTOT disentangles two significantly different populations of employed jobseekers.

Based on data on employed job seekers and labour market flows in a number of OECD countries, we cand then empirically assess whether employed jobseekers are actually competing for posts with the unemployed. The competition hypothesis has three testable implications. First, as shown above, it implies that estimates of unemployment outflow equations not controlling for employed jobseekers tend to overstate the elasticity of job finds with respect to unemployment. This is because a larger unemployment pool tends to discourage on-the-job search thereby increasing outflows per given levels of unemployment and vacancies. Second, competition for jobs implies that unemployment outflow *rates* (that is, outflows as proportion of the unemployment stock at the beginning of the period) should be decreasing in the number of employed jobseekers, while complementarity effects imply a positive elasticity of unemployment outflows with respect to employed jobseekers. Third, competition between employed and unemployed jobseekers involves decreasing vacancies in job-to-job shifts, while "musical chair" effects imply that for each vacancy filled by an employed jobseeker another vacancy is opened, that is, vacancies are non-decreasing in the extent of worker flows from one job to another.

Table 5 reports estimates of unemployment outflows, outflow rates and vacancy equations in all countries for which we could get data on both unemployment outflows and job-to-job shifts for a number of years, namely Spain (where we had access to quarterly data over the 1987-94 period), UK and Germany (where data were available only at yearly frequencies in the 1983-93 period). Job-to-job shifts were derived as the difference between the total number of hirings in the economy and employment inflows. It should be stressed that the two flow data come from different statistical sources: hiring data are drawn from administrative sources (e.g.

contracts employers are legally compelled to notify) while employment inflows can be estimated on the basis of LFS data (e.g. retrospective questions or linked records as those discussed in Section 1). The role played by administrative data in the derivation of JJ shifts makes the latter figures not strictly comparable across countries.

Bearing the above caveats in mind, three facts, highlighted by Table 5 are particularly important. First, unemployment outflow equations not including employed jobseekers (first column) tend to display much higher coefficients for the stock of unemployed than specifications with JTOT or JPUSH (second and third column). This is consistent with the competition hypothesis: our model predicts that the omission of employed jobseekers from unemployment outflow equations could bias upwards unemployment stock coefficients. The inclusion of employed jobseekers in the unemployment outflow equation does not, however, affect the coefficient for vacancies, while we would have expected it to increase as a result of a better specification of the outflow equation. Second, outflow rates (equations 4 through 7) seem to be negatively affected by the number of employed jobseekers, especially those pushed to search for jobs. Recovering from our logit estimates the underlying elasticities, we have that an increase by one unit in the pool of employed jobseekers reduces the probability of job finds for the unemployed by .4 per cent. This effect is stronger in Germany than in the UK, while there is no indication that in Spain competition from employed jobseekers is stronger than in the UK (columns 6 and 7). Third, vacancy growth is significantly decreasing in the number of job-to-job shifts, which is at odds with "musical chair" effects whereby job-to-job shifts involve a larger turnover of vacancies and are neutral (or positively affect) vacancy stocks. Overall, *regression results displayed in Table 5 are broadly supportive of competition for jobs between employed and unemployed jobseekers.*

## Final Remarks

Why are "rigid" labour markets characterised by relatively large rates of job reallocation? How can it be that low-unemployment countries have the highest inflows into unemployment? In this paper we argue that these two rather puzzling facts have a common explanation. Rigid labour markets look flexible because their regulations reduce flows from employment to unemployment but induce larger job-to-job shifts; this implies greater competition for jobs between employed and unemployed jobseekers, and puts a cap on the number of hires involving persons coming from the ranks of the unemployed. As only the short-term unemployed can successfully compete for jobs with employed jobseekers, larger inflows into unemployment -- discouraging those with a job to engage in job search -- may ultimately lower unemployment stocks.

The strategy followed in this paper to assess the empirical relevance of the model relies on aggregate data on labour market flows. While a better characterisation of job-to-job shifts can only come only from micro data on individual employment histories, estimates of aggregate matching functions have the advantage of subsuming substitution effects within the two populations of jobseekers and hence may offer a better basis to assess the extent and nature of competition between employed and unemployed jobseekers.

The estimates of matching functions presented in this paper are consistent with the presence of decreasing search effectiveness with unemployment duration. Thus, they do not invalidate a basic assumption of our model. We also find some support to the view, embedded in our model, that a larger number of employed jobseekers tends to reduce outflow rates from unemployment by taking up jobs which would be available otherwise to unemployed jobseekers. Unemployment outflows are particularly responsive to changes in the number of those searching on-the-job because their job is temporary or they face a high risk of being laid-off. Moreover, estimates of vacancy equations suggest that job-to-job shifts tend to reduce the number of employment opportunities available for unemployed jobseekers.

Two relevant policy issues are raised by the above observations. First, it may be counterproductive to try and contain the rise of unemployment during recessions by making it more difficult for employers to shed labour. Containing inflows into

unemployment has the negative implication of encouraging on-the-job search and this makes it even more difficult for those in the pool to find a new job. Put another way, strict employment security regulations can at best work only when unemployment is so low that its increased duration can be more than compensated by reduced inflows in the pool.

Second, given the strong competition exerted by employed "pushed" to search for jobs, the question arises as to whether public authorities in European countries should pursue greater flexibility in labour markets via the liberalisation of temporary contracts and other forms of precarious work. These measures -- if not accompanied by reduced costs to dismiss workers under indefinite duration jobs -- may end up creating an intermediate status between employment and unemployment, which pushes the long-term unemployed even more at the margins of labour market adjustment.

## References


BERTOLA, G. (1990), Job Security, Employment and Wages, *European Economic Review*, n. 34 (851-886).

BERTOLA, G. and ICHINO, A. (1994) Crossing the River: A Comparative Perspective of Italian Employment Dynamics, paper prepared for the Economic Policy panel meeting, 21-22/4/95.

BLANCHARD, O. and DIAMOND, P. (1989) The Aggregate Matching Function, in Diamond, P. (ed.) *Growth/Productivity/Unemployment*, MIT Press.

BOERI, T. (1994) Transitional Unemployment, *Economics of Transition*, n.2.

BOERI, T. (1995) Is Job Turnover Countercyclical?, *European University Institute Working Papers*, n.12/95.

BURDA, M. and WYPLOSZ, C. (1994), Gross Worker and Job Flows in Europe, *European Economic Review*, n.38 (1287-1315).

BURGESS, S. (1991), Matching and Unemployment Dynamics in a Model of Competition between Employed and Unemployed Job Searchers, Centre for Economic Performance Working Papers.

BURGESS, S. (1994) The Reallocation of Employment and the Role of Employment Protection Legislation, *CEP Discussion Papers*, n.193.

COLES, M. and SMITH, E. (1994) Marketplaces and Matching, *CEPR Discussion Paper* n.1048.

GREY, A. (1993) Job Creation and Job Destruction: an Overview of Recent Literature and Directions for Research, mimeo, OECD.

GRUBB, D. and WELLS, W. (1994) Employment Regulation and Patterns of Work in EC Countries, *OECD Economic Studies*, n.21, (7-58).

HALL, R. D. (1982) The Importance of Lifetime Jobs in the US Economy, *American Economic Review*, 72, (709-756).

JOVANOVIC, B. (1979) Job Matching and the Theory of Turnover, *Journal of Political Economy*, n.87, (972-990).

JOVANOVIC, B. (1984) Matching, Turnover and Unemployment, *Journal of Political Economy*, n.92, (108-122).

LAZEAR, E.P. (1981) Agency, Earning Profiles, Productivity and Hours Restrictions, *American Economic Review,* n. 71 (606-20).

MORTENSEN, D. and PISSARIDES, C.A. (1994) Job Creation and Job Destruction in the Theory of Unemployment, *Review of Economic Studies,* n.61 (397-415).

MILLARD, S.P. and MORTENSEN, D. (1994) The Unemployment and Welfare Effects of Labour Market Policy: A Comparison of the US and the UK, mimeo.

OECD (1994a) *Employment Outlook,* Paris.

OECD (1994b) *The OECD Jobs Study: Evidence and Explanations*, Paris.

PISSARIDES, C. (1994) Search Unemployment with On-the-job Search, *Review of Economic Studies*, n. 61 (457-475).

## Annex 1

The stationarity of the wage distribution implies that employed *not* seeking a job will either lose their current position at the exogenous layoff rate d or continue to be employed without searching. We can therefore rewrite the value of being employed and not seeking for another job as follows:

$$V_e = \frac{w + \delta d\, Vu^s}{1 - \delta(1-d)} \tag{18}$$

Similarly, for given $\pi_s$, the value of being short-term unemployed is time-invariant. Hence, we can solve (5) for $Vu^s$ and substitute this expression in (18). This yields:

$$Ve = \frac{w(1-\delta(1-\pi_l)) + \delta d(u - cu)(1+\delta)(\pi_l - \pi_s)}{(1-\delta)^2 + \delta d(1 - \delta - \pi_s + 2\pi_s\pi_l) + \delta(\pi_l(1-\delta))} \tag{19}$$

We now turn to the value of being employed jobseeker. Under our assumptions, (7) can be written as follows:

$$Vj = \frac{w - c_2 + \delta[(1-d)\pi_j \max(Ve, Vj) + d\, Vu^s]}{1 - \delta(1-d)(1-\pi_j)} \tag{20}$$

Substituting (2) into (3), and noting that Vj is -- for given $\pi_j$ -- time-invariant, it is straightforward to show that employed jobseekers stop searching only at wages which are discretely (due to the presence of search costs) above those currently earned. Notice further that both (2) and (3) are linearly increasing in the current wage, but Vj at a lower rate than Ve. This can be easily checked by considering the limiting case where transition probabilities are not state-dependent (that is, $\pi_j = \pi_l = \pi_s = \pi$, which implies -- by (2), (3) and (4) that also sj = sl = su). In fact, in the latter case:

$$Vj_w - Ve_w = \frac{\delta\pi[1 - \delta + \pi(\delta(1+d) - 2d]}{[(1-\delta)^2 + \delta(d(1 - \delta - \pi(1-2\pi) + \pi - \delta\pi)(\delta(1 - \pi - d(1-\pi) - 1)]} \tag{21}$$

where $Vj_w$ and $Ve_w$ denote, respectively, the derivatives of (2) and (3) with respect to the current wage rate. The numerator of (5) is positive, while the denominator is negative for any positive value of the discount factor. Finally, when the expected wage rate exceeds the cost of job search (otherwise nobody would ever search while being employed in our model), we have that Vj is positive for w=0, while Ve equals zero. Furthermore, both Vj and Ve are linear in current wages. Hence, the above implies existence and uniqueness of the locus Vj=Ve.

Given that employed differ only by the wage they receive, changes in $\pi_j$ can be assimilated to shifts in the expected (after-search) wage rate, and will cause an upward shift of the Vj curve, while leaving the Ve curve unaltered (as shown in Chart 4). It follows that, for larger (lower) $\pi_j$, the number of

employed jobseekers must increase (decrease). The degree by which J will react to changes in $\pi_j$ will depend on the shape of the wage distribution and on the position on it of the initial reservation wage, unless in the case where the wage distribution is uniform.

## Annex 2

By implicit function rule, the slope of the UV curve is given by:

$$\frac{\delta V}{\delta U} = \frac{d + slM - \frac{U^* M_v V}{J^{*2}} \frac{\delta J^*}{\delta U^l}}{-M_v U^* (1 - \frac{\phi_v V}{J^*} sj(1-U))} \qquad (22)$$

where $U^*$ stands for the number of unemployed converted into efficiency units (i.e., $su\ U^s + sl\ U^l$). A sufficient condition for the numerator being positive is that $\delta J^*/\delta U^l$ is negative[1], whilst the denominator is negative since $sj\ \phi_v\ V\ (1-U) \sim sj\ J < J^*$ by definition. Inspection of higher order derivatives indicate that the curve is convex towards the origin.

The slope of the VV curve is given by:

$$\frac{\delta V}{\delta U^l} = \frac{M_j \frac{\delta J^*}{\delta U^l} - \gamma}{-\gamma - M_v - \eta_{m,v}} \qquad (23)$$

where $\eta_{mv}$ denotes the elasticity of job matching with respect to vacancies. Both numerator and denominators are negative when $\delta J^*/\delta U^l$ is negative. Second-order derivatives indicate that the curve is convex in U.

A marginal change in d, the exogenous layoff rate, would unambiguously shift outwards the UU curve. In fact, we have that along this curve:

$$\frac{\delta U}{\delta d} = \frac{1 - U + M\ su(1-U)(\frac{U^* \eta_{mj^*}}{J^*} - 1)}{\frac{U^* M_v V}{J^{*2}} \frac{\delta J^*}{\delta U^l} - d - slM} \qquad (24)$$

where $\eta_{mj^*}$ denotes the elasticity of job finds with respect to effective jobseekers. The numerator is negative insofar as $\eta_{mj}$ and $(U^*/J^*)$ are both less than unit. The denominator is negative as argued above.

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[1] The case where the UV curve is upward sloping, at least limited to some regions, and the associated possibility of multiple equilibria is not considered herein for the sake of simplicity.

In the case of the VV curve we have that:

$$\frac{\delta U}{\delta d} = \frac{\frac{-V}{J^*}\eta_{mv}\frac{\delta J^*}{\delta U^s}}{\gamma - M_J\frac{\delta J^*}{\delta U^l}} \qquad (25)$$

The numerator of (8) is positive (negative) when the number of effective jobseekers is decreasing (increasing) in short-term unemployment, while the denominator is negative as discussed above.

Table 1

**Strictness of employment protection schemes, unemployment stocks and job turnover**

Spearman rank correlation coefficients

| | Unempl. stock | Unempl. inflows | Job turnover | Job Creation | Job Destruction |
|---|---|---|---|---|---|
| Employment protection schemes (1) | | | | | |
| Correlation coefficient | 0.28 | -0.79 | -0.22 | -0.31 | -0.24 |
| Marginal significance level | (.24) | (.00) | (.46) | (.30) | (.43) |
| Degrees of freedom | 19 | 19 | 12 | 12 | 12 |

Notes:

(1) OECD ranking of countries by strictness of employment protection schemes

**Table 2**

## Labour market flows

(evidence from linked LFS records and retrospective questions)

| ***a) Linked LFS records*** | Flows from Employment to Out-of-the-labour force (as % of employment) | Unemployment Inflows (as % of the LF) |
|---|---|---|
| Australia (92-93) | 3.47 | 4.28 |
| Canada (90-91) | 9.71 | 6.34 |
| Netherlands(90-92)(1) | 2.06 | 1.61 |
| Norway (92-93) | 6.37 | 4.12 |
| Spain (92-93) | 4.45 | 2.26 |
| Sweden(90-91) | 2.88 | 3.59 |
| US (92-93) | 5.33 | 3.92 |
| ***b) Retrospective questions*** | Flows from Employment to Out-of-the-labour force (as % of employment) | Employment Outflows (as % of employment) |
| Austria(90-91) | 0.74 | 0.83 |
| Luxembourg(91-92) | 2.85 | 3.71 |
| UK (92-93) | 3.84 | 5.48 |
| US(89-90) | 10.39 | 13.53 |
| Europe-8 (1983-91) | n.a. | 6.70 |

Notes:
(1) Data for the Netherlands are averages of two-years transitions.
(2) Average period data.

Sources:
For linked records, OECD (1995); for retrospective question LES and EEC(1994).

**Table 3**

**Unemployment duration and effectiveness of job search**

(Regression results)

Estimated equation (a) :

$\ln(OJt) = Const + b1 \ln(USt-1) + b2 \ln(ULt-1) + b3 [\ln(USt-1)-\ln(UL-1)]^2 + alpha \ln(Vt-1)$

| | | OJt-1 | alpha | su | sl | rho | CRS (1) | Wald (2) | Wald (3) |
|---|---|---|---|---|---|---|---|---|---|
| OECD COUNTRIES | | | | | | | | | |
| LTU=Unemp>12 months | | | 0.02 | 0.65 ** | 0.35 ** | -0.17 | 1.34 | 168.59 ** | |
| | | | (0.27) | (12.26) | (6.43) | | | | |
| *CZECH REPUBLIC* | | | | | | | | | |
| LTU=Unemp>12 months | Levels | | 0.073 | 0.956 | 0.044 | -0.183 | -2.60 ** | 378.14 ** | 314.68 ** |
| | | | (0.041) | (0.134) ** | (0.134) | | | | |
| | First diff. (4) | 0.174 | -0.008 | 0.809 | 0.191 | -0.190 | | 244.1 ** | 172.94 ** |
| | | (0.036) ** | (0.023) | (0.040) ** | (0.040) ** | | | | |
| STU= monthly inflows | Levels | | 0.052 | 0.777 | 0.223 | -0.512 | -1.51 | 674.51 ** | 583.93 ** |
| | | | (0.034) | (0.026) ** | (0.026) ** | | | | |
| | First diff. (4) | 0.263 | 0.008 | 0.974 | 0.026 | -0.030 | | 319.87 ** | 29.55 ** |
| | | (0.017) ** | (0.034) | (0.091) ** | (0.091) | | | | |
| *SLOVAK REPUBLIC* | | | | | | | | | |
| STU= monthly inflows | Levels | | 0.157 | 0.723 | 0.277 | -0.447 | -0.74 | 218.41 ** | 32.22 ** |
| | | | (0.074) * | (0.170) ** | (0.170) | | | | |
| | First diff. (4) | -0.377 | 0.080 | 1.725 | -0.725 | 0.633 | | 4132.2 ** | 31.15 ** |
| | | (0.019) ** | (0.036) * | (0.712) * | (0.712) | | | | |

Notes: su=b1/(b1+b2); sl=b2/(b1+b2); rho=(-2*b3*(b1+b2))/(b1*b2).

Standard errors robust to heteroschedasticity in parentheses. One asterisk denotes significance at 5%; two asterisks denote significance at 1%.

(1) CRS = t-test of the hypothesis of constant returns to scale.

(2) Wald-test of joint significance.

(3) Wald = Wald test of joint significance of su and sl.

(4) GMM estimation.

*Source: OECD-CCEET Regional Database.*

Table 4

**Persons declaring to be searching for a job while being employed**
(% of total employment, 1983-1991 average yearly data unless otherwise specified)

| | JTOT | JPUSH | JPULL | JPUSH/ JTOT |
|---|---|---|---|---|
| Belgium | 2.596 | 1.955 | 0.641 | 75.30% |
| | (0.180) | (0.221) | (0.164) | |
| Czech Rep. 1993-94 | 4.885 | 1.537 | 3.348 | 31.46% |
| | (0.087) | (0.110) | (0.085) | |
| Denmark | 5.811 | 2.426 | 3.384 | 41.75% |
| | (0.187) | (0.167) | (0.332) | |
| France | 5.108 | 3.450 | 1.658 | 67.54% |
| | (0.137) | (0.183) | (0.104) | |
| Germany | 2.056 | 1.290 | 0.766 | 62.75% |
| | (0.135) | (0.099) | (0.219) | |
| Great Britain | 5.583 | 2.843 | 2.740 | 50.92% |
| | (0.141) | (0.114) | (0.227) | |
| Greece | 3.072 | 1.731 | 1.341 | 56.35% |
| | (0.174) | (0.221) | (0.157) | |
| Ireland | 4.729 | 2.561 | 2.167 | 54.16% |
| | (0.050) | (0.071) | (0.098) | |
| Italy | 3.640 | 2.493 | 1.147 | 68.48% |
| | (0.127) | (0.168) | (0.146) | |
| Luxemburg 1992 | 1.808 | 0.941 | 0.867 | 52.03% |
| Netherlands 1987-1 | 9.248 | 5.055 | 4.193 | 54.66% |
| | (0.010) | (0.222) | (0.256) | |
| Poland 1992-94 (2) | 6.396 | 3.222 | 3.175 | 50.37% |
| | (0.077) | (0.101) | (0.085) | |
| Portugal 1986-1991 | 3.017 | 1.347 | 1.670 | 44.65% |
| | (0.166) | (0.216) | (0.131) | |
| Slovenia 1994 | 5.927 | 3.296 | 2.630 | 55.62% |
| Spain 1986-1991 | 2.049 | 1.543 | 0.506 | 75.31% |
| | (0.323) | (0.391) | (0.147) | |

Correlation Coefficients

| | U | V | JTOT | JPUSH |
|---|---|---|---|---|
| JTOT | -0.04 | 0.43 * | | |
| JPUSH | 0.15 | 0.24 | 0.91 * | |
| JPU | -0.21 | 0.54 * | 0.92 * | 0.68 * |

Notes:

Coefficients of variation in parenth One asterisk denotes significance at 5 per cent levels
JTOT = Total of employed declaring, at the date of the survey, to be searching for another job;
JPUSH = employed declaring to be searching because either their current job is at risk or is temporary;
JPULL = employed declaring to be searching for a better job.
(1) Quarterly data 93:2 - 94:3.
(2) Quarterly data 92:2 - 94:3.

*Source: National Labour Force Surveys*

**Table 5**

**Unemployment Outflows and the Competition with Employed Jobseekers**

*(Regression results, Spain, Germany and the UK)*

*Estimated Equations:*

*a) ln(Oit) = c + ait + b1 ln(Uit-1) + b2 ln(Jit-1) + b3 [ln(Uit-1)-ln(Jit-1)]^2 + b4 ln(Vit-1)*

*b) ln(pu/(1-pu)) = c + ait + b1 Uit-1 + b2 Jit-1 + b3 Vit-1*

*c) DVit = ait + b1 Vit-1+ b2 Oit-1 + b3 Jjit-1*

| | a) Unemployment Outflows | | b) Outflow Rates(a) | | | | | c) Vacancies | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | |
| C | -6.92 | -3.14 | -3.43 | 2.6060 | -3.0927 | -3.3273 | -3.3568 | | |
| | *(1.49)* | *(0.71)* | *(0.85)* | *(2.75)* ** | *(4.90)* ** | *(3.75)* ** | *(6.14)* ** | | |
| U(-1) | 1.15 | 0.85 | 0.90 | -0.0002 | -0.0002 | -0.0001 | -0.0001 | -0.02 | OJ(-1) |
| | *(2.30)* * | *(2.14)* * | *(2.41)* ** | *(1.17)* | *(0.99)* | *(0.78)* | *(0.86)* | *(0.41)* | |
| JTOT(-1) | | -0.19 | | -0.0007 | | -0.0004 | | -0.01 | JJ(-1)(d) |
| | | *(0.62)* | | *(1.97)* * | | *(1.25)* | | *(5.07)* ** | |
| JPUSH(-1) | | | -0.25 | | -0.0007 | | -0.0006 | | |
| | | | *(1.78)* * | | *(2.71)* ** | | (2.73) ** | | |
| V(-1) | 0.41 | 0.43 | 0.39 | 0.0046 | 0.0036 | 0.0053 | 0.0040 | 0.03 | V(-1) |
| | *(1.96)* | *(2.75)* ** | *(2.90)* ** | *(7.52)* ** | *(6.14)* ** | *(7.13)* ** | *(5.40)* ** | *(0.54)* | |
| T | 0.05 | 0.04 | 0.04 | 0.0325 | 0.0337 | 0.0295 | 0.0330 | | |
| | *(4.84)* ** | *(3.27)* ** | *(3.21)* ** | *(2.87)* ** | *(2.91)* ** | *(1.68)* | *(2.48)* * | | |
| JDE(-1)(b) | | | | | | -0.0013 | -0.1363 | | |
| | | | | | | *(2.39)* * | *(1.89)* | | |
| JESP(-1)(c) | | | | | | -0.0008 | -0.0004 | | |
| | | | | | | *(0.46)* | *(0.24)* | | |
| Country dummies | *yes* | *yes* | *yes* | *yes* | *yes* | *yes* | *yes* | *yes* | |
| Time dummies | *no* | *no* | *no* | *no* | *no* | *no* | *no* | *yes* | |
| R2bar | 0.22 | 0.22 | 0.23 | 0.46 | 0.47 | 0.44 | 0.44 | 0.33 | |
| nobs | 45 | 45 | 43 | 45 | 43 | 45 | 43 | 45 | |

Notes: Quarterly 1987-94 data for Spain; yearly 1983-91 data for the UK and Germany

heteroskedastic-consistent t-statistics in parentheses. One asterisk denotes significance at 5 per cent; 2 asterisks at 1 per cent.

(a) Unemployment outflows over the unemployment stock at the beginning of the period (logit estimates).

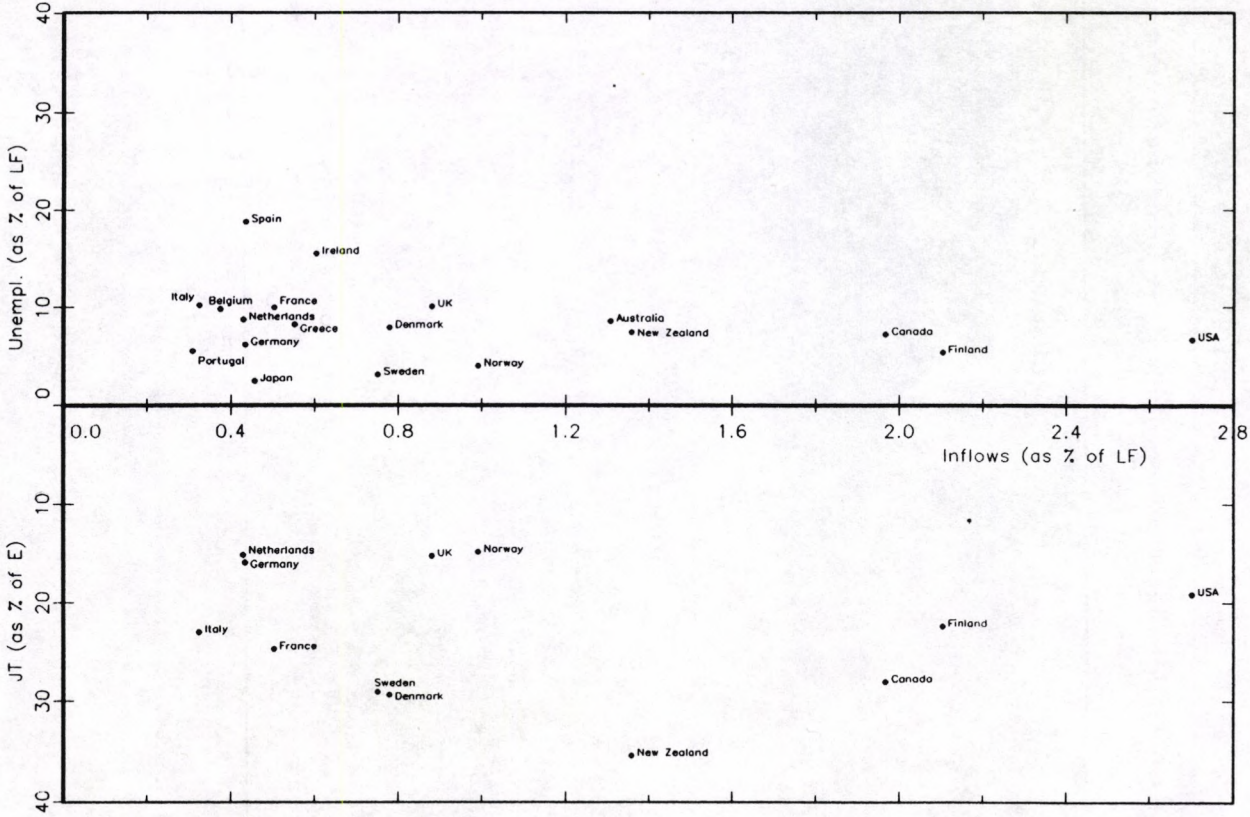
(b) JTOT (equation 6) or JPUSH (equation 7) for Germany.

(c) JTOT (equation 6) or JPUSH (equation 7) for Spain.

(d) Job-to-job shifts, estimated as the difference between total hirings and inflows into employment.

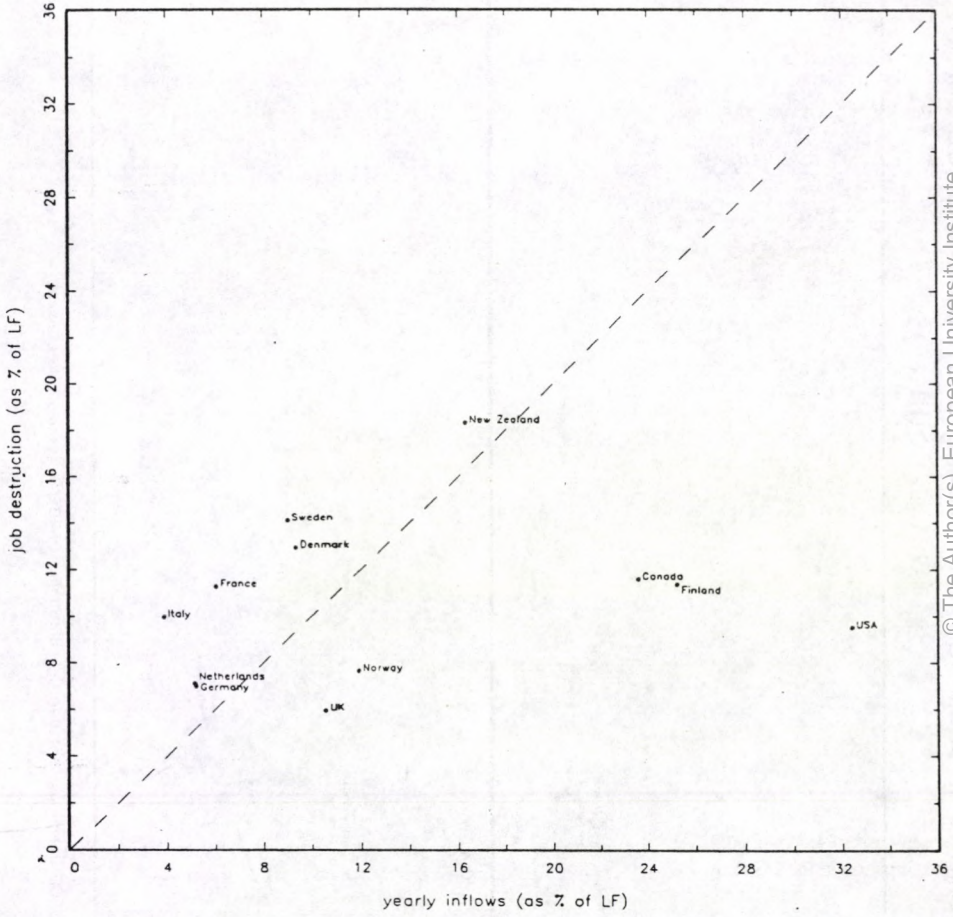
Source: Labour Force Surveys for data on unemployment and employed jobseekers; administrative sources for data on hirings.

# CHART 1: Unemployment stocks and flows, and job turnover
## (OECD countries)



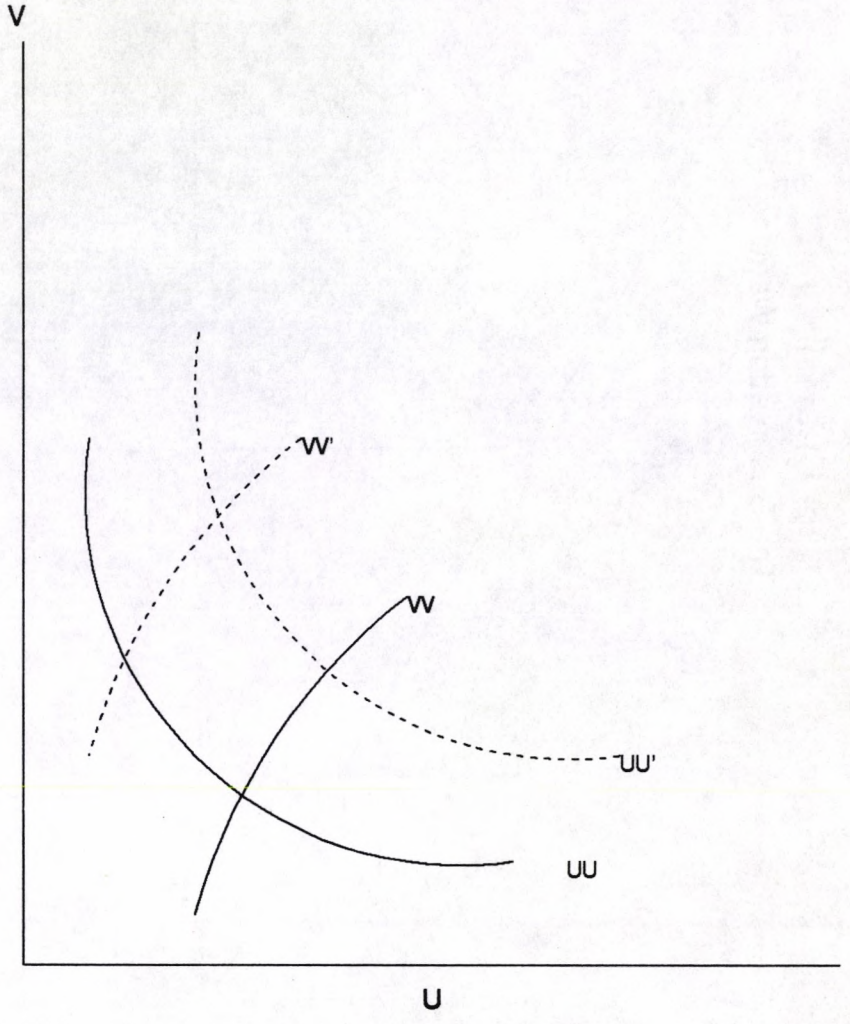

Source: OECD unemployment duration database, OECD job turnover database

CHART 2: Job destruction and inflows into unemployment
(OECD countries)



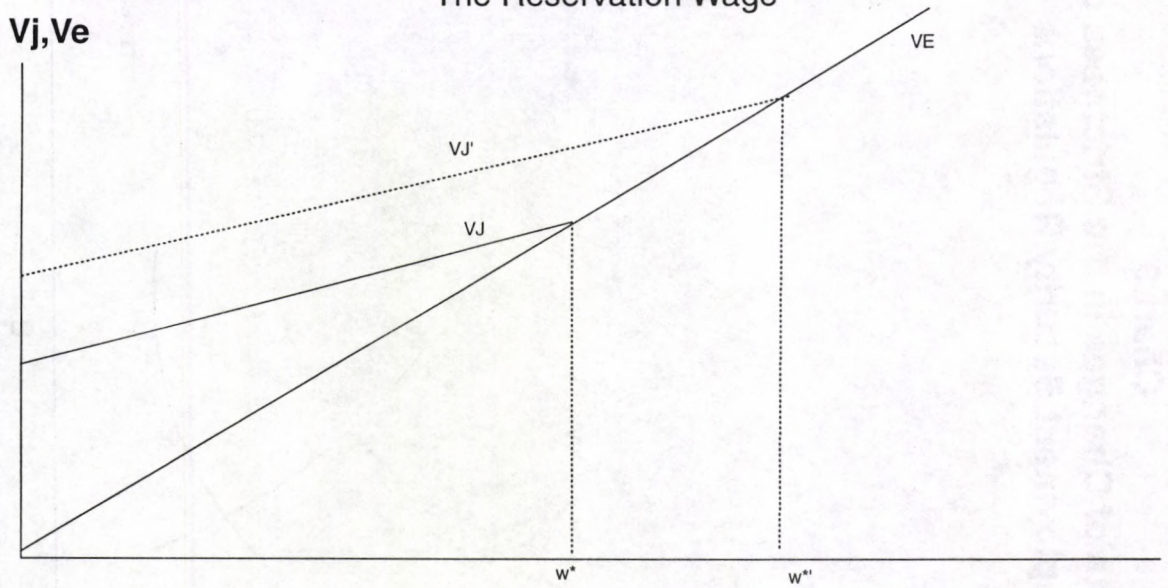

Source: OECD unemployment duration database, OECD job turnover database

## Chart 3
## Effects of Changes in the Strictness of Employment Security Regulations



## Chart 4

The Reservation Wage



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